Feb. 1, 1938. A. FEUCHT 2,107,198

FEEDING MECHANISM FOR ROCK DRILLS

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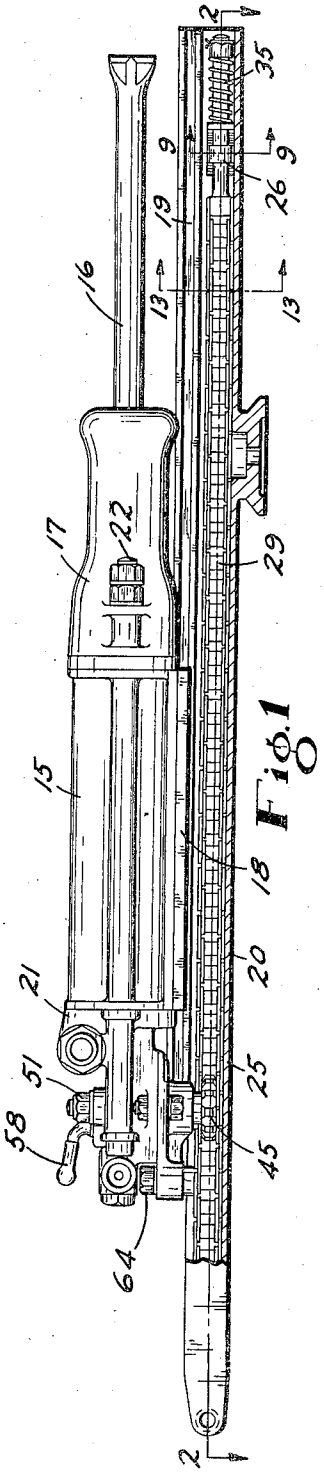


Fig. 1

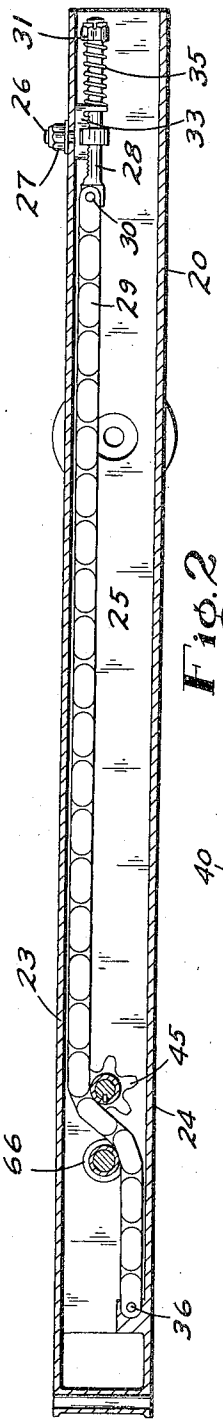


Fig. 2

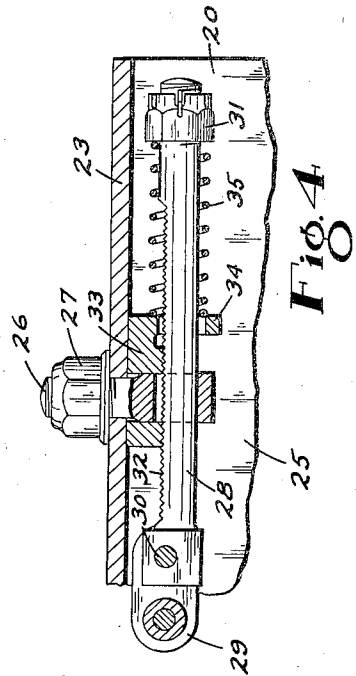


Fig. 4

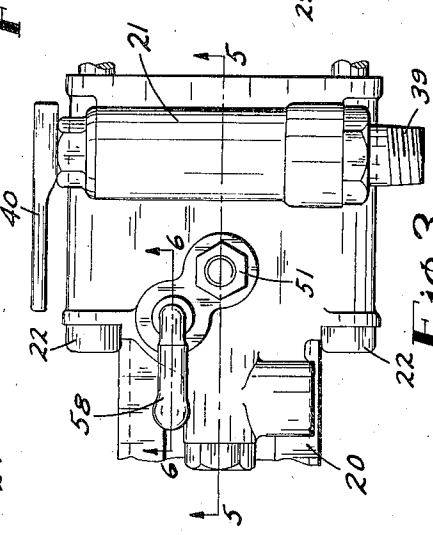


Fig. 3

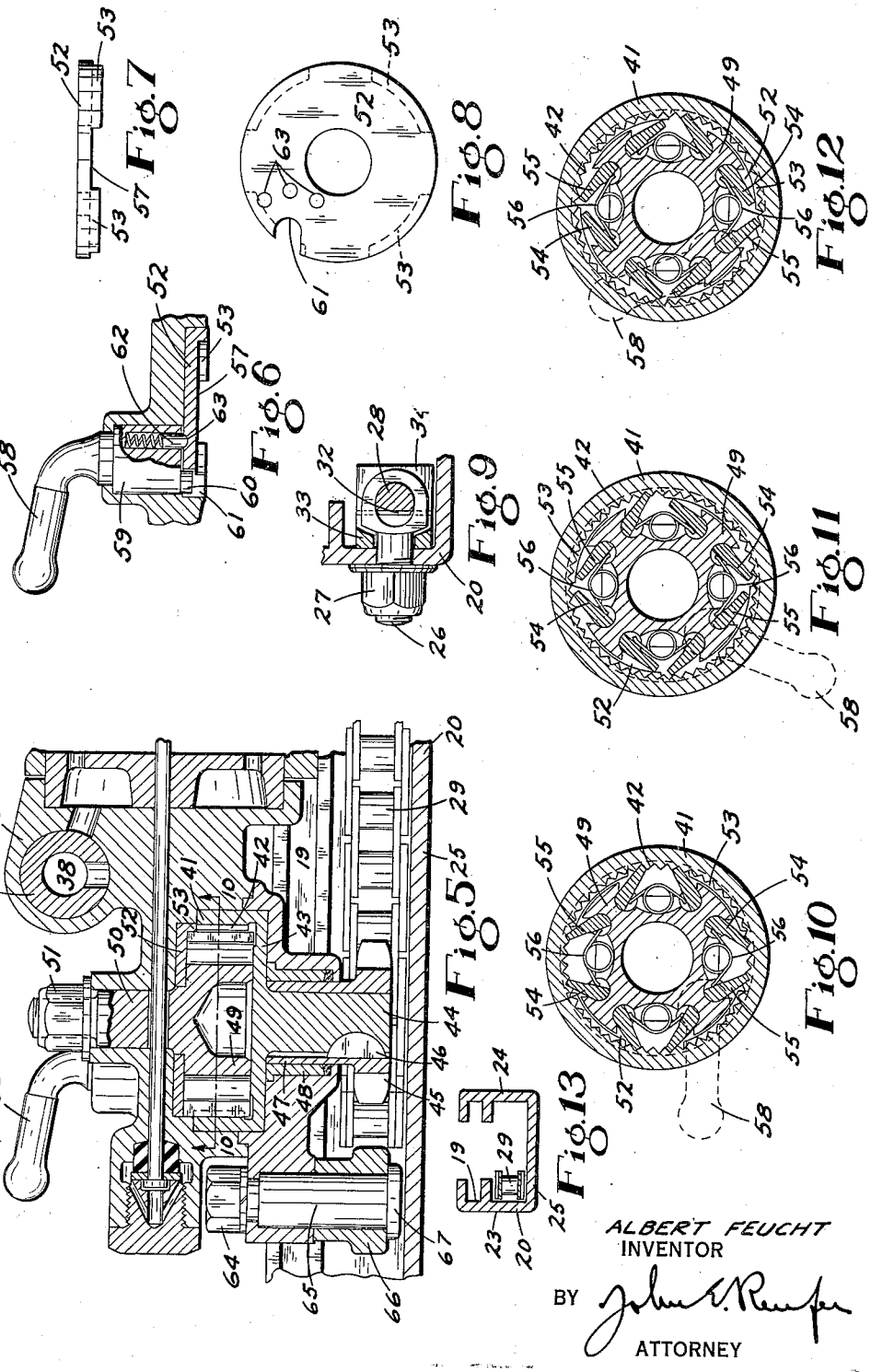
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FEEDING MECHANISM FOR ROCK DRILLS

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2,107,198

FEEDING MECHANISM FOR ROCK DRILLS

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Application April 5, 1937, Serial No. 135,065

8 Claims. (Cl. 255—45)

This invention relates broadly to rock drills, but more particularly to a feeding mechanism for rock drills of the percussive type.

One object of this invention is to utilize the force of the jars imparted to a rock drill due to the reversal of the piston strokes therein, for feeding the drill toward or away from the work.

The principle involved in this type of feeding mechanism known in the art as "jump feed", has been used before in different constructions including for instance a stationary rack carried by the support having a gear carried by the drill meshing with the rack, and means being provided for controlling the direction of rotation of the gear. To render such mechanism effective and operable under different working conditions, it is absolutely necessary to provide means preventing the movement of the drill in a direction adverse to its feeding motion, or in other words to prevent the recoil of the drill. In the rack and gear construction above mentioned, it has been found that due to the practical clearance usually provided between the engaging teeth of the gear and rack, the recoil of the drill could not be prevented efficiently to produce the desired result. Attempts made to reduce the practical clearance between the engaging teeth of the gear and rack in an effort to prevent the recoil of the drill were unsuccessful due to wear taking place between the engaging guiding surfaces of the drill and the support on which the drill is slidably mounted. This wear resulted primarily from a thrust of the drill against the support, which thrust was transmitted to the drill by the action of the gear carried thereby on the rack. Through this wear, the gear carried by the drill was allowed to move out of perfect engagement with the teeth of the rack, thereby permitting recoil of the drill relative to the support.

It is therefore another object of this invention to produce a feeding mechanism for a rock drill wherein the recoils of the drill are effectively prevented by a simple construction which is strong, durable and efficient.

Other objects and advantages more or less ancillary to the foregoing and the manner in which the various objects are attained, reside in the specific construction and aggroupment of the elements peculiar to this structure, as will become apparent from a more complete examination of this specification, in the claims of which they are assembled certain specific combinations of parts and specific constructions indicative of the scope and spirit of the invention.

In the drawings:

Fig. 1 is a longitudinal view partly in section illustrating a rock drill having the improved feeding mechanism applied thereto.

Fig. 2 is a longitudinal sectional view taken in a plane indicated by line 2—2 in Fig. 1.

Fig. 3 is an enlarged top view of the rock drill rear end shown toward the left in Fig. 1.

Fig. 4 is an enlarged view of the chain connection shown toward the right in Fig. 2.

Fig. 5 is an enlarged longitudinal sectional view taken in a plane indicated by line 5—5 in Fig. 3.

Fig. 6 is an enlarged longitudinal sectional view taken in a plane indicated by line 6—6 in Fig. 3.

Fig. 7 is a slightly enlarged side view of a movable plate shown in Fig. 6, while Fig. 8 is a top view of the plate.

Fig. 9 is an enlarged cross sectional view taken in a plane indicated by line 9—9 in Fig. 1.

Figs. 10, 11 and 12 are cross sectional views taken in a plane indicated by line 10—10 in Fig. 5, showing movable parts in different positions.

Fig. 13 is a cross sectional view taken in a plane indicated by line 13—13 in Fig. 1.

Referring to the drawings in which like symbols designate corresponding parts throughout the several views, 15 represents the usual fluid actuated percussive rock drill having a piston (not shown) reciprocable therein for delivering impacts to a drill steel 16 operatively mounted within a front housing 17. This drill is also provided with the usual guides 18 slidable within corresponding guideways 19 formed within a stationary support 20. Toward the left in Figures 1 and 2, hereinafter denoted as the rear end of the machine, there is provided a rear housing 21, which housing together with the front housing 17, is rigidly secured to the drill 15 by two side bolts 22.

The support 20 is formed of a substantially U-shaped cross section including two side walls 23 and 24, and a bottom wall 25. Toward the right in Figures 1 and 2, hereinafter denoted as the front end of the support, the side wall 23 has a hole formed therethrough accommodating an eye-bolt 26 which extends therefrom to receive a nut 27. Slidable through the eye-bolt head, there is a stem 28 having one end detachably secured to one end of a chain 29 by a pin 30, while the other end of the stem is formed with a detachable head in the form of a nut 31. This stem is provided with small teeth 32 meshing with corresponding teeth formed on a block 33 loosely mounted on the bolt 26, and having an annular flange 34 through which the stem is free to slide. Interposed be-

tween the flange 34 and the stem head 31, there is a compression spring 35 subjecting the stem 28 to a tensional force. The chain 29 extends longitudinally of the support 20, and has its other end attached to the side wall 24 by a pin 36 disposed near the rear end of the support.

Referring now more particularly to Fig. 5, the rear housing 21 has rotatable therein a throttle valve 37 formed with a central chamber 38 into which pressure fluid may be admitted through an inlet connection 39, Fig. 3. Secured to the throttle valve 37, there is a handle 40 through which the valve may be rotated for controlling the admission of the pressure fluid into the drilling motor 15.

Back of the throttle valve 37, the housing 21 is adequately machined to rotatably receive a ratchet ring 41 having teeth 42 formed internally thereof and provided with an integral bottom plate 43, from which depends a shaft or stem 44 protruding from the housing to receive a sprocket wheel 45 secured thereon by a key 46. The axis of rotation of the stem 44 is located in a vertical plane passing through the longitudinal center axis of the rock drill 15, thus bringing the sprocket wheel 45 in a plane perpendicular to the side walls of the support 20 on which is mounted the chain 29. The sprocket wheel 45 has a sleeve 47 extending upwardly therefrom and journaled within a hardened bushing 48.

Located within the ratchet ring 41 and extending somewhat higher than the ring, there is the head 49 of a stem 50, which extends upwardly therefrom and protrudes from the housing 21 to receive a nut 51 by which the head 49 is held in position. On the head 49, there is rotatably mounted a plate or disk 52 having a partly annular bead 53 depending from the marginal edge thereof and resting on the ratchet ring 41.

The head 49 is properly machined to pivotally carry two sets of pawls 54 and 55, each set comprising four pawls grouped in pairs and each pair having a compression spring 56 mounted between the pawls and constantly acting thereon for urging the pawls in engagement with the teeth 42 of the ratchet ring 41. These pawls extend the full height of the head 49 and are supported against axial movement in one direction by the bottom plate 43 of the ratchet ring 41, and in the other direction by the plate 52. To control the engagement of the pawls with the teeth of the ratchet ring 41, the annular bead 53 of the disk 52 is formed with four cut away portions or notches 57 positionable relative to the pawls for permitting or preventing the engagement of the pawls with the teeth 42. The disk 52 may be rotated through a handle 58 extending above the housing 21 and having a cylindrical body portion 59 rotatably mounted in the housing beside the stem 50. From this body portion depends a tail 60 disposed eccentrically relative to the center axis of the body 59 and engageable with the side wall of a notch 61 provided in the disk 52 near the marginal edge thereof. For locking the disk in position, there is provided a spring pressed plunger 62 slidable within the body of the handle 58 and engageable within small depressions 63 formed on the disk.

Secured within the rear end portion of the housing 21 by a nut 64, there is a stem 65 disposed within the same vertical plane as and parallelly to the axis of rotation of the shaft 44. This stem protrudes below the housing to rotatably receive a roller 66 supported by an annular shoulder 67 formed on the stem 65.

Extending through the housing 21, there is a cleansing fluid conveying tube 68, which tube is removably secured in position by a plug 69. This tube is usually included in fluid actuated rock drills for admitting cleansing fluid through the drill steel for cleaning the bottom of the drilled hole.

The roller 66 and the sprocket wheel 45 are positioned on each side of the chain as clearly shown in Fig. 2. The sprocket wheel is meshing with the chain, while the roller is acting as a guide keeping the chain in engagement with the sprocket wheel. The distance between the roller 66 and the wheel 45 is calculated to afford a free movement of the chain therebetween while assuring the maximum possible engagement of the chain with the sprocket wheel.

In the operation of the mechanism, pressure fluid, through the throttle valve 37, is admitted into the rock drill 15 for causing the reciprocation of its piston. Due to the reversal of the piston strokes within the motor 15, jars or backward and forward movements are imparted to the drilling motor 15 relative to its support 20.

Referring now more particularly to the operation of the feeding mechanism, it will be understood that when it is desired to feed the drilling motor 15 toward the work, the disk 52, through the rotation of the handle 58, may be positioned as shown in Fig. 11. In this instance, the rib 53 is engaging the upper end of the four pawls 55 to maintain them out of engagement with the teeth 42, while the four pawls 54 are positioned within the notches 57 of the disk 52 and therefore are in engagement with the teeth 42. During the forward jars imparted to the drilling motor, the ratchet ring 41, due to the operative engagement of the sprocket wheel 45 with the chain 29, will rotate in a clockwise direction in Fig. 11, while the pawls 54 simply ride the teeth 42 without interference. During the rearward jars or recoils imparted to the drilling motor, the rotation of the ratchet ring 41 in a counterclockwise direction, which would normally result due to the operative engagement of the sprocket wheel 45 with the chain 29, is prevented by the engagement of the pawls 54 with the teeth 42, thereby preventing the movement of the drilling motor 15 in a direction adverse to that of its step by step feeding motion.

When it is desired to feed the drilling motor away from the work, the disk 52 through the handle 58, may be positioned as shown in Fig. 12. In this instance, the pawls 54 are moved out of engagement with the teeth 42, while the pawls 55, now located within the notches 57, are capable of engagement with the teeth of the ratchet ring 41, permitting thereby a step by step rearward feeding motion of the drilling motor and preventing any forward or recoil movement of the motor relative to the support.

With the disk 52 positioned as shown in Fig. 10, the pawls 54 and 55 are located within the notches 57, that is in engagement with the teeth 42 of the ratchet ring 41, thereby preventing any movement of the drilling motor 15 relative to the support 20.

Due to the disposition of the chain as clearly shown in Fig. 2, it will be understood that the operative engagement between the chain 29 and the sprocket wheel 45 is greater than that possible between a rack and a gear, thereby reducing wear and preventing undue play due to clearance between the chain and the sprocket wheel.

In the present construction, the radial thrust imparted to the sprocket wheel due to its action

on the chain, which thrust would tend to cause the disengagement of the sprocket wheel with the chain and allow recoil movements of the motor 15 relative to the support, is overcome by the action of the roller 65 on the other side of the chain 29, which action counterbalances the thrust above mentioned and maintains the sprocket wheel in perfect operative engagement with the chain.

As shown in Fig. 2, the chain extends from one end of the support where it is fastened alongside of one side wall of the support, then diagonally between the two side walls of the support for operative engagement partly around the sprocket wheel. Finally the chain extends from the sprocket wheel alongside of the other side wall of the support to the other end of the latter where it is fastened to the stem 28. During the longitudinal movement of the motor 15, the chain 29, even though fastened at both ends to the support 20, is gradually shifted by the roller 66 from one side wall to the other side wall of the support 20.

Through the connection clearly shown in Fig. 4, it is possible to maintain the chain under proper tension. When first assembling the chain, the nut 27 is loosened to allow the slidable movement of the stem 28 relative to the block 33. The length of the chain is such that the spring 35 must be compressed before the end of the chain can be secured to the stem by the pin 30. After connecting the chain to the stem 28, the spring 35 is released or permitted to act on the head 31, effecting thereby the slidable movement of the stem relative to the block 33 and exerting the desired tension on the chain. Upon the tightening of the nut 27, the eye-bolt head acting on the stem 28 will force the teeth 32 of the latter to engage the corresponding teeth of the block 33 for locking the stem relative to the support. In practice, it has been found that certain commercial chains are constructed in a manner eliminating to a great extent the stretching of the chain while in operation. However, if for any reason the chain should slacken sufficiently to impair the proper operation of the feeding mechanism, it is only necessary to loosen the nut 27. In this instance, the spring 35 acting on the head 31 will automatically cause the slidable movement of the stem 28 relative to the block 33, and again exert the necessary tension of the chain.

Although the foregoing description is necessarily of a detailed character, in order to completely set forth the invention, it is to be understood that the specific terminology is not intended to be restrictive or confining and it is to be further understood that various rearrangements of parts and modifications of structural detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

I claim:

1. In a drilling apparatus, the combination with a support, of a motor slidable on the support having jars imparted thereto, of a recoil resisting mechanism for said motor including a sprocket wheel rotatably carried by the motor and a chain carried by the support against longitudinal movement relative thereto, said chain passing partly around said sprocket wheel in operative engagement therewith, stop means for preventing the rotation of said sprocket wheel in one direction to enable a step by step longitudinal movement of the motor in one direction, and means carried by the motor and engaging the chain for guiding the latter partly around said sprocket wheel.

2. In a drilling apparatus, the combination with a support formed with two side walls each having a guideway provided therein, of a motor slidable in said guideways having jars imparted thereto, of a recoil resisting mechanism for said motor including a chain having one end attached to one side wall of said support and the other end attached to the other side wall, a sprocket wheel rotatably carried by the motor in operative engagement with said chain, stop means for preventing the rotation of said sprocket wheel in one direction to enable a step by step longitudinal movement of the motor in one direction, and means carried by the motor engaging said chain for guiding the latter from one to the other side wall of the support during the longitudinal movement of the motor.

3. In a drilling apparatus, the combination with a support formed with two side walls each having a guideway provided therein, of a motor slidable in said guideways having jars imparted thereto, of a recoil checking mechanism for said motor including a sprocket wheel rotatably carried by the motor and a chain extending from near one end of the support alongside of one of said side walls, then diagonally between said side walls and partly around said sprocket wheel for operative engagement therewith, and finally alongside of the other of said side walls to a place near the other end of the support, stop means for preventing the rotation of said sprocket wheel in one direction to enable a step by step longitudinal movement of the motor in one direction, and means carried by the motor engaging said chain for guiding the latter diagonally between said side walls.

4. In a drilling apparatus, the combination with a support, of a motor slidable on the support having jars imparted thereto, of a recoil checking mechanism for said motor including a flexible element secured to the support against longitudinal movement relative thereto, a rotatable member carried by the motor engaging said element for rotation due to the jars imparted to the motor, stop means for preventing the rotation of said member in one direction to enable a step by step feeding motion of the motor, and means carried by the motor engaging said flexible element for effecting lateral displacement of the latter relative to the support during the feeding motion of the motor.

5. In a drilling apparatus, the combination with a support, of a motor slidable on the support having jars imparted thereto, of a recoil resisting mechanism for said motor including a chain longitudinally of the support secured thereto against longitudinal movement and a sprocket wheel rotatably carried by the motor in operative engagement with the chain, said sprocket wheel having a radial thrust imparted thereto due to its engagement with said chain tending to move the sprocket wheel away from the chain, stop means for preventing the rotation of said sprocket wheel in one direction to enable a step by step longitudinal movement of the motor in one direction, and means carried by the motor engaging said chain for counterbalancing said radial thrust.

6. In a drilling apparatus, the combination with a support, of a motor slidable on the support having jars imparted thereto, of a recoil resisting mechanism for said motor including an elongated element longitudinally of the support

formed with traction means, a member rotatably carried by the motor in operative engagement with the traction means of said element, said member having a radial thrust imparted thereto due to its operative engagement with said traction means, stop means for preventing the rotation of said member in one direction to enable a step by step feeding motion of the motor, and means carried by the motor engaging said elongated element for counterbalancing the radial thrust imparted to said member.

7. In a drilling apparatus, the combination with a support, of a motor slidable on the support having jars imparted thereto, of a recoil resisting mechanism for said motor including a chain longitudinally of the support secured thereto against longitudinal movement and a sprocket wheel rotatably carried by the motor in operative engagement with the chain, stop means for preventing the rotation of said sprocket wheel in one direction to enable a step by step feeding motion of the motor, a connection between one end of said chain and the support including an element normally locked to the support, spring means subjecting said element to a tensional force, and means for releasing said element from said support for transmitting said tensional force to said chain.

8. In a drilling apparatus, the combination with a support, of a motor slidable on the support having jars imparted thereto, of a recoil resisting mechanism for said motor including a chain longitudinally of the support, a sprocket wheel carried by the motor in operative engagement with said chain, stop means for preventing the rotation of said sprocket wheel in one direction to enable a step by step feeding motion of the motor, and means carried by the motor guiding said chain into more than tangential operative engagement with said sprocket wheel.

ALBERT FEUCHT.

DISCLAIMER

2,107,198.—*Albert Feucht*, Garfield Heights, Ohio. FEEDING MECHANISM FOR ROCK DRILLS. Patent dated February 1, 1938. Disclaimer filed August 21, 1939, by the assignee, *The Cleveland Rock Drill Company*.

Hereby enters this disclaimer to claims 1, 4, 5, 6, and 8 in said specification.

[*Official Gazette September 19, 1939.*]